
Chapter 4 — PRI Implementation

Overview

This chapter provides the information required to install PRI on a Meridian 1 Option 11 system:

- hardware and software installation
- programming procedures for basic call service.

While either the hardware or software may be installed first, the PRI cannot be enabled and tested until both are completed.

This chapter covers the most common type of Northern Telecom PRI installations:

- 23B+D Primary Rate Interface (PRI) installation between Meridian 1 PBX systems.
- 23B+D Primary Rate Interface (PRI) installation between a Meridian 1 PBX and DMS-100 (ISA).

This chapter builds on the ESN programming that is assumed to be already in place. The installation technician should have a basic understanding of NARS and CDP. (See Appendix A for additional information on ESN).

The related ISDN features are treated individually in the chapter called *Feature Implementation*.

Hardware Requirements

Circuit cards

To implement PRI on the Meridian 1 Option 11, the following hardware is required:

Circuit card	Description
NTAK09	DTI/PRI circuit card
NTAK20	Clock-controller daughterboard. Option 11 supports only one active clock controller per system
NTAK93	D-Channel-handler interface (DCH) daughterboard
NTBK51	Downloadable D-Channel daughterboard (DDCH). Connects to the NTAK09 DTI/PRI card.

Cables

The following cables are required for PRI connections:

- PRI to external T1 cable
- NTBK04 - carrier cable
- NT8D97 50 foot extension (if needed)

Channel Service Units

When connecting the DTI/PRI to the public network, CSUs are required by most operating companies. One CSU is required per PRI. Suitable CSUs which support 64 Kbps clear and Bipolar 8 Zero Substitution (B8ZS) are available from vendors such as Verilink, Digitalink, Kentrox and Tellabs.

Note: Contact your Northern Telecom Sales representative for specific local CSU requirements.

Echo Cancellor

Echo Cancellers are required for voice calls over direct satellite links using PRI.

Note: Echo Cancellor control is currently not supported on Option 11.

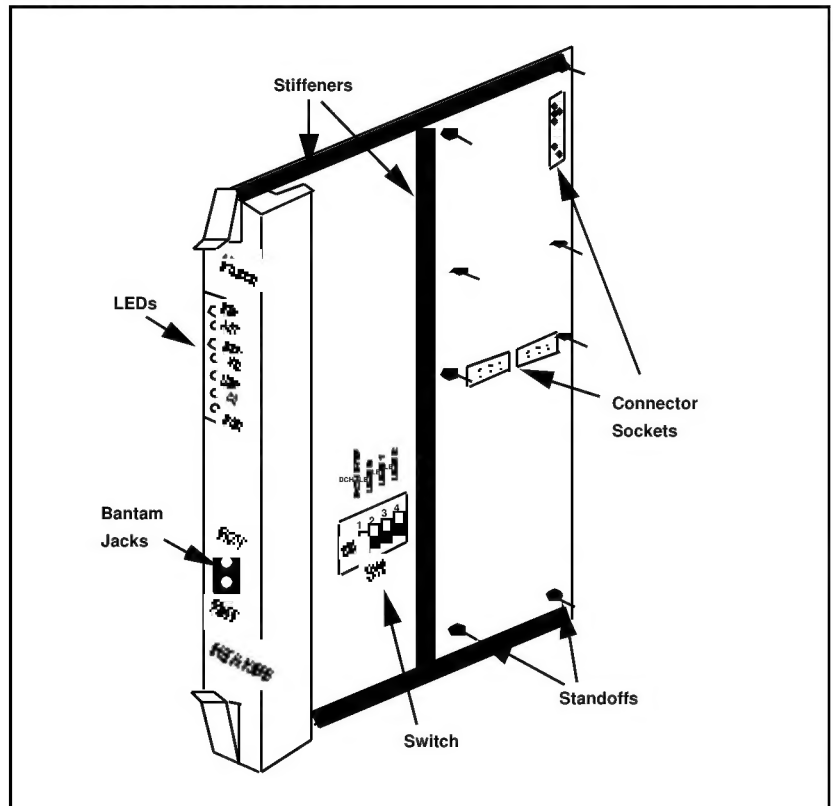
Hardware description

NTAK09 DTI/PRI circuit card

The NTA09 Digital Trunk Interface/Primary Rate Interface (DTI/PRI) card provides the physical interface for the DS-1 facility T-1 carrier on the Meridian 1 Option 11. It is required for PRI and DTI operation and is also used for ISL shared-mode applications.

The DTI/PRI card occupies any single card slot (1-9) in the Option 11 main cabinet. Figure 61 shows the faceplate layout, the location of the switch and the position of the daughterboards and connectors. See the “DTI/PRI maintenance” chapter in this guide for information about the faceplate LEDs.

Figure 61
NTAK09 DTI/PRI circuit card



NTAK20 Clock Controller (CC) daughterboard

Digital Trunking requires synchronized clocking so that a shift in one clock source will result in an equivalent shift of the same size and direction in all parts of the network. On Option 11 systems, synchronization is accomplished with the NTAk20 clock controller circuit card. The Clock Controller circuitry synchronizes the Option 11 to an external reference clock, and generates and distributes the clock to the system. Option 11 can function either as a slave to an external clock or as a clocking master. The NTAk20AA version of the clock controller meets AT&T Stratum 3 and Bell Canada Node Category D specifications. The NTAk20BA version meets CCITT stratum 4 specifications. See the chapter called *Network clocking* for details.

Shelf slot assignment

On non-ECM system cabinets, the NTAk20 may be placed in slots 1-9. On cabinets NTAk11Dx and NTAk11Fx, the active NTAk20 must be placed in slots 1-3 (slots 4-10 may not be used.)

Clocking modes

The Option 11 system supports a single clock controller that can operate in one of two modes: tracking or non-tracking (also known as free-run).

Tracking mode

In tracking mode, one or possibly two DTI/PRI cards supply a clock reference to a clock controller daughterboard. When operating in tracking mode, one DTI/PRI is defined as the primary reference source for clock synchronization, while the other is defined as the secondary reference source (PREF and SREF in LD 73).

There are two stages to clock controller tracking:

- tracking a reference, and
- locked onto a reference.

When tracking a reference, the clock controller uses an algorithm to match its frequency to the frequency of the incoming clock. When the frequencies are very near to being matched, the clock controller is locked onto the reference. The clock controller will make small adjustments to its own frequency until both the incoming and system frequencies correspond.

If the incoming clock reference is stable, the internal clock controller will track it, lock onto it, and match frequencies exactly. Occasionally, however, environmental circumstances will cause the external or internal clocks to drift. When this happens, the internal clock controller will briefly enter the tracking stage. The green LED will flash momentarily until the clock controller is locked onto the reference once again.

If the incoming reference is unstable, the internal clock controller will continuously be in the tracking stage, with the LED flashing green all the time. This condition does not present a problem, rather, it shows that the clock controller is continually attempting to lock onto the signal. If slips are occurring, however, it means that there is a problem with the clock controller or the incoming line.

Free-run (non-tracking)

In free-run mode, the clock controller does not synchronize on any source, it provides its own internal clock to the system. This mode can be used when the Meridian 1 is used as a master clock source for other systems in the network. Free-run mode is undesirable if the Meridian 1 is intended to be a slave. It can occur, however, when both the primary and secondary clock sources are lost due to hardware faults or when invoked by using software commands.

Clock controller LED states

The clock controller LED on the NTAK09 faceplate will be in various states, depending on the status of the clock controller:

LED	Clock controller
On (Red)	NTAK20 is equipped and disabled.
On (Green)	NTAK20 is equipped and is either locked to a reference or is in free run mode.
Flashing (Green)	NTAK20 is equipped and is attempting to lock (tracking mode) to a reference. If the LED flashes continuously over an extended period of time, check the CC STAT in LD60. If the CC is tracking this may be an acceptable state. Check for slips and related clock controller error conditions. If none exist, then this state is acceptable, and the flashing is identifying jitter on the reference.
Off	NTAK20 is not equipped.

NTAK93 D-Channel Handler Interface (DCHI) daughterboard

The NTAk93 DCHI daughterboard interfaces with the Meridian 1 Option 11 Central Processing Unit (CPU) and mounts on the NTAk09 DTI/PRI circuit card for PRI or ISL shared mode applications. The DCHI is responsible for performing the Q.921 layer 2 protocol information. It transfers layer 3 signaling information between two adjacent network switches.

The NTAk93 DCH daughterboard, when installed on the NTAk09 circuit card, is addressed in the same slot as the NTAk09. The NTAk93 can use SDI I/O addresses 0 to 15 and port 1.

Note: I/O addresses 0, 1, 2, 8 and 9 are preconfigured on the Option 11 and must not conflict with the I/O addresses on the NTAk93 card.

A minimum of one NTAk93 is required for each PRI link. If more than one PRI link is connected to the same end location, a single DCHI circuit card can support up to a maximum of 8 PRI connections for the Option 11 system. This allows a total of 190 B-Channels or PRI trunks to be supported if a backup D-Channel is also used. A total of 191 B-channels or PRI trunks are supported if a backup channel is not used.

NTBK51 Downloadable D-Channel daughterboard

The NTBK51 DDCH daughterboard interfaces with the Meridian 1 Option 11 Central Processing Unit (CPU) and mounts on the NTAk09 DTI/PRI circuit card for PRI D-Channel applications. The DDCH is equivalent to the MSDL card used on the larger Meridian 1 systems, but it only supports D-channel applications (no SDI or ESDI).

The NTBK51 DDCH daughterboard, when installed on the NTAk09 circuit card, is addressed in the same slot as the NTAk09.

A minimum of one NTBK51 is required for each PRI link. If more than one PRI link is connected to the same end location, a single DDCH circuit card can support up to a maximum of 8 PRI connections for the Option 11 system. This allows a total of 190 B-Channels or PRI trunks to be supported if a backup D-Channel is also used. A total of 191 B-channels or PRI trunks are supported if a backup channel is not used.

Installing PRI hardware

The NTAK09 is a standard-size peripheral equipment circuit card that is installed in the Option 11 main cabinet. It provides ISDN primary rate interface and digital trunk interface capability. The NTAK09 serves as a motherboard to the NTAK20 clock controller, the NTAK93 D-channel handler daughterboard, and the NTBK51 downloadable D-channel (DDCH) daughterboard.

Use the following procedure to mount and remove the NTAK20 CC and the NTAK93 DCHI and NTBK51 DDCH daughterboards onto the NTAK09 DTI/PRI.

Mounting the daughterboards on the NTAK09

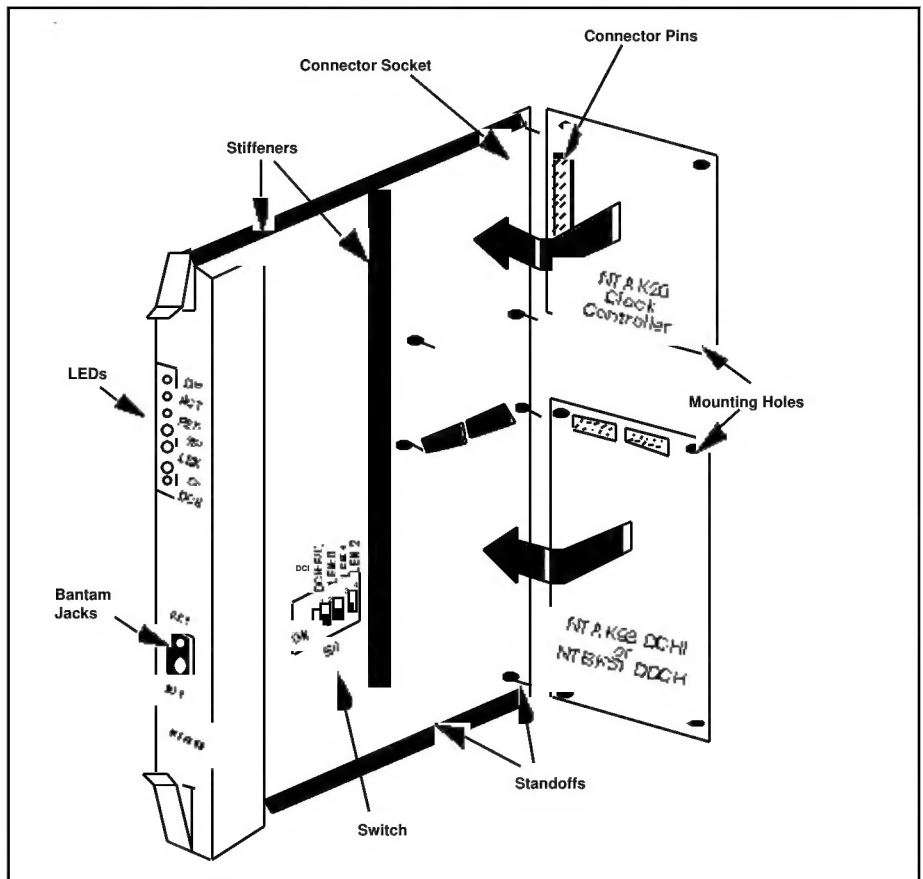
Install the NTAK93 DCHI or NTBK51 DDCH daughterboard before the NTAK20 daughterboard. Work on a flat surface when mounting or removing daughterboards.

- 1 Visually inspect the connector pins on the underside of the daughterboard. Any pins that are bent should be re-aligned prior to mounting.
- 2 Place the NTAK09 down flat on an anti-static pad.
- 3 From an overhead viewpoint, with the daughterboard parallel above the NTAK09 and the connector pins aligned over the connector sockets, line up the mounting holes on the daughterboard (see figure below) with the tops of the standoffs on the NTAK09.
- 4 Slowly lower the daughterboard towards the NTAK09, keeping the standoffs in line with all four holes, until the holes are resting on the tops of the four standoffs.

If more than a very slight amount of pressure is required at this point, the connector pins may not be aligned with the connector socket. If so, lift the daughterboard off the NTAK09 and return to step 2.

- 5 Gently apply pressure along the edge of the board where the connector is located until the STAND OFFS at the two corners adjacent to the connector snap into a locked position. Then press down on the two corners on the opposite side until they also are locked into place.

Figure 62
Daughterboard installation



Removing the daughterboards from the NTAK09

Use these guidelines to remove the NTAK20 CC, and the NTAK93 DCHI or NTBK51 DDCH daughterboards from the NTAK09 DTI/PRI card. Because of the physical layout of the mother and daughterboards, the NTAK20 should be removed before the NTAK93 or NTBK51.

- 1 Starting at the two corners opposite the connector, gently lift each corner out of the locking groove of the standoff.
- 2 At the two corners adjacent to the connector, gently lift the entire side until the mounting holes are clear of the locking groove of the standoff.
- 3 To remove the connector pins, grasp the edge of the board adjacent to the connector and lift gently.

If more than one NTAK09 card is installed, the additional cards may not carry daughterboards, depending on the system configuration. At least one NTAK20 (per system) is always required, however.

Setting the switches

Set the switches on the NTAK09 DTI/PRI card according to the table below.

Table 26
NTAK09 switch settings

Switch Setting	1 DCH F/W	2 (LEN 0)	3 (LEN 1)	4 (LEN 2)
Distance to Digital Cross-Connect				
0 - 133 feet	Off	Off	Off	On
133 - 266 feet	Off	On	On	Off
266 - 399 feet	Off	Off	On	Off
399 - 533 feet	Off	On	Off	Off
533 - 655 feet	Off	Off	Off	Off

Inserting the NTAK09 into the main cabinet

Insert the NTAK09 circuit card into the desired slot in the Option 11 main cabinet. (Card slots 1 through 9 are available).

Check for available card slots in the base cabinet and print the configuration record to determine which slots may be used. To do this, use PRT CFN in LD22.

Connecting the cables

Connect the NTBK04 cable to the 50-pin amphenol below the card slot in which the NTAK09 circuit card is installed. Connect the other end of the cable to the CSU or DSX-1 cross connect.

The NTBK04 is twenty feet long. If additional distance is required, the NT8D97AX fifty-foot extension is available up to a 600 foot maximum. The only cable required to support the NTAK09 circuit card is the NTBK04.

If you require pinout information on the NTBK04 cable, refer to the table below.

Table 27
DS-1 line interface pinout for NTBK04 cable

From 50-pin MDF connector	to DB-15	signal name	description
pin 48	pin 1	T	transmit tip to network
pin 23	pin 9	R	transmit ring to network
pin 25	pin 2	FGND	frame ground
pin 49	pin 3	T1	receive tip from network
pin 24	pin 11	R1	receive ring from network

Software enabling the card

Use step 1 to enable DTI/PRI cards. If the clock controller and D-channel interface are not enabled in step 1, go to step 2.

Step 1

- Software enable all NTAK09 DTI/PRI cards using LD 60:

ENLL C

where C is the DTI/PRI card number (DLOP). The card number associated with a DTI/PRI card is based on the slot in which the card is installed.

Note: The DCHI and PRI loops must be programmed prior to software enabling the NTAK09. Refer to the section "Programming Meridian 1 to Meridian 1 PRI" for further information.

- Under normal conditions, this step enables the clock controller and D-Channel interface. If enable fails, go to step 2.

Step 2: (if required):

Software enable the clock controller using overlay 60. Enable clock tracking on primary digital loop by issuing the following command:

ENL CC 0

- Software enable the NTAK93 (DCHI) daughterboard using overlay 96 command

ENL DCHI N

(where N is the DCHI I/O address).

- Within about 30 seconds, the D-Channel layer 3 should be established. To confirm, request the current status of the D-Channel by issuing the command
- The system should respond **DCH N EST OPER**, meaning that the D-Channel is established and operational.

Programming Meridian 1 to Meridian 1 PRI

Use this procedure to configure the PRI loops, DCHI interface, DCH link and ISDN trunk route and trunks (B-channels) that are required to implement PRI between Meridian 1 systems. No feature applications other than Basic Call Service are included in the programming.

Prerequisites

PRI loops must be configured before defining the DCH links or PRI applications. Note that in the following procedure, the bold responses must be entered for proper operation of Meridian 1 to Meridian 1 PRI.

Prompts which do not show a response can be left at default. For more information on any of these prompts, refer to the Option 11 Software Guides—books 1 and 2.

Restrictions and Limitations

The allowable range of main-cabinet slot numbers for the DTI/PRI circuit card is 1-9. Note that slot 0 is preprogrammed for the CPU/Conf card and slot 1 is preprogrammed for the TDS/DTR card, effectively leaving slots 2-9 available for the DTI/PRI card.

Service change and maintenance commands that refer to loop numbers refer to slot numbers in the Option 11 system.

Programming procedure

Programming Meridian 1 to SL-1 to SL-1 PRI involves seven major steps:

- 1** Define error detection thresholds — LD73.
- 2** Add a PRI loop — LD17.
- 3** Add a DCHI card — LD17.
- 4** Define a PRI customer — LD15.
- 5** Define a PRI service route — LD16.
- 6** Define service channels (B-channels) PRI trunks — LD14.
- 7** Define clock synchronization — LD73.

Step 1:

Define the threshold parameters and Clock synchronization. Use Overlay 73. For more detailed information, refer to book 2 of the Option 11 Software Guide.

Prompt	Response	Description
REQ	NEW or CHG	
TYPE	DDB	digital data block
TRSH	0-15	assign a threshold set or table
RALM	1-(3)-128	yellow alarm 24-hour threshold
BIPC	1-(2)-128	24-hour bit rate violation threshold
LFAC	1-(3)-128	24-hour loss of frame alignment threshold
BIPV	1-(3)-4 1-(2)-4	bit rate (bipolar violation and CRC) monitoring limits for maintenance and out-of-service thresholds
SRTK	1-(5)-24 1-(30)-3600	frame slip-tracking-monitoring limits (in hours)
SRNT	1-(15)1024 1-(3)-1024	non-tracking slip-rate monitoring maintenance and out-of-service thresholds
LFAL	1-(17)-10240 1-(511)-10240	loss of frame alignment monitoring limits
SRIM	(1)-127	slip rate improvement timer
SRMM	1-(2)-127	maximum number of times the slip rate exceeds the maintenance limit

Step 2:

Add a PRI loop. Use Overlay 17. For more detailed information, refer to book 1 of the Option 11 Software Guide.

Prompt	Response	Description
REQ	CHG	
TYPE	CEQU	configuration data block
DLOP	C dd ff	where: • C is the DTI/PRI digital card number (1-9) • dd is the number of data calls allowed (0-24) on this PRI (default 24) • ff is the frame format used (D2,D3,D4,ESF) where default is ESF
MODE	PRI	select Primary Rate Interface mode
LCMT	B8S AMI	zero code substitution method — must match the far-end and facility equipment B8S--B8ZS code substitution and AMI--B7 code substitution rule. The preferred method is B8ZS to get 64 K clear channel as long as the T1 carrier equipment supports it.
YALM	DG2 (FDL)	yellow alarm method — prompted only if the frame format is ESF — Must match the far end. Use FDL with ESF and use DG2 with non-ESF. If not prompted, then DG2 is set automatically.
TRSH	0-31	the maintenance and out-of-service threshold set to be used for this PRI loop, as configured in overlay 73.

Step 3:

Add a D-Channel Interface. Use Overlay 17. For more detailed information, refer to book 1 of the Option 11 Software Guide.

Prompt	Response	Description
REQ	CHG	
TYPE	CFN	configuration data block
ADAN	NEW DCH 1-15 CHG DCH 1-15 OUT DCH 1-15	Add a primary D-Channel port number. Any unused SDI port number Change a primary D-Channel Out the primary D-Channel
CTYP	DCHI MSDL	DCHI for D-Channel configuration for the NTAK09 card. Enter DCHI for the NTAK93 DCH card. Enter MSDL for the NTBK51 Downloadable D-channel daughterboard
CDNO	1-9	Card slot number to be used as the primary DDCH/DCHI. Do not enter 1.
PORT	1	PORT must be set to "1"
DES	<CR>	Back-up DCHI port number, if required
USR	PRI	D-channel is for ISDN PRI only.
IFC	SL1	Interface type is Meridian 1 - Meridian 1
DCHL	(1-9)	PRI card number which will be carrying the D-channel. Must match entry made for the "CDNO" associated with the "DCHI" prompt above
OTBF	1-(16)-127	number of output request buffers. Note: for a single PRI link, leave this prompt at default (16). Add 5 output request buffers per additional link.
SIDE	NET (USR)	Prompted only if IFC is set to SLI. Default is set to slave. NET = network, the controlling switch USR= slave to the controller Note: In X11 release 17 and earlier, enter MAS for NET and SLAV for USR.

Prompt	Response	Description
RLS	XX	X11 software release of far-end. This is the current software release of the far end. If the far end has an incompatible release of software, it prevents the sending of application messages, i.e. for Network Ring Again.
OVLR	<CR>	Allow or disallow overlap receiving on a D-channel. Default is NO.
LAPD	YES,(NO)	change LAPD parameters. Enter carriage return if timers are to be left at default. The following timers are prompted only if LAPD is set to YES. (They can all be left at default during initial set-up.)
T23	1-(20)-31	interface guard timer checks how long the interface takes to respond. In units of 0.5 seconds (default 20 = 10 seconds).
T200	2-(3)-40	retransmission timer in units of 0.5 seconds (default 3 = 1.5 seconds).
N200	1-(3)-8	maximum number of retransmissions
N201	4(260)	maximum number of octets in information field
K	1-(7)-32	maximum number of outstanding unacknowledged frames (NAKS)

Step 4:

Define a PRI customer. Use Overlay 15. For more detailed information, refer to book 1 of the Option 11 Software Guide.

Prompt	Response	Description
REQ	NEW,CHG	
TYPE	CDB NET	customer data block Networking Data (Release 21 gate opener)
CUST	0-31	customer number
LDN0	xxxx	Listed Directory number 0 must be defined for ISDN PRI DID service. The length of LDN0 determines the number of trailing digits translated as the dialed DN on PRI DID routes. Up to seven digits may be entered if DNXP option 150 is equipped. Otherwise, up to four digits may be entered.
AC2		ESN Access Code 2. Enter incoming ISDN call types (NARS network translation types) for which AC2 must be inserted when INAC = YES in LD 16 Route Data Block. Multiple responses are allowed. Prompted only if NARS is equipped. If a NARS call type is not entered here, it is defaulted to AC1.
	NPA	E.164 National
	NXX	E.164 Subscriber
	INTL	International
	SPN	Special Number
	LOC	Location Code
ISDN	YES	customer is equipped with ISDN

Prompt	Response	Description
PNI	(0), 1-32700	Private Network Identifier. Each customer data block must have a unique PNI when multi-customer option is equipped. PNI = 1 is typical for CUST = 0. It must be matched by the PNI in the far-end RDB. Note: using the default value of PNI = 0, prevents operation of features like NRAG, NACD and NMS.
HNPA	NPA	telephone area code for this Meridian 1. Sent as part of setup message as calling line identification.
HNXX	NXX	telephone local exchange code for this Meridian 1. Sent as part of setup message as calling line identification.
HLOC	XXX	home location code (NARS) -prompted when PRA = YES
LSC	1-9999	One to four digit Local Steering Code, if required in the Coordinated Dialing Plan (CDP). LSCs are required only if the CDP DN is longer than the local PDNs. The CLID sent for a CDP call is composed of the LSC defined in LD 15 plus the PDN of the calling set. Various ISDN network features depend on the CLID as the "return address" for sending feature control messages. Multiple LSCs can be defined in LD 87 for CDP, but only one LSC can be defined here for CLID.

Step 5:

Configure an ISDN service route. Use Overlay 16. For more detailed information, refer to book 1 of the Option 11 Software Guide.

Prompt	Response	Description
REQ	NEW,CHG	
TYPE	RDB	route data block
TKTP	XXX	TIE trunk only, allowed between MSL-1
DTRK	YES	digital trunk route
DGPT	PRI	ISDN (23B + D)— prompted only if PRA = YES in LD15
ISDN	YES	ISDN option
MODE	PRA	route used for PRA only
PNI	(0), 1-32700	Private Network Identifier. Each customer data block must have a unique PNI when multi-customer option is equipped. PNI = 1 is typical for CUST = 0. It must be matched by the PNI in the far-end RDB. Note: using the default value of PNI = 0, prevents operation of features like NRAG, NACD and NMS.
IFC	SL1	interface type: Meridian 1 to Meridian 1
CHTY	BCH	signalling type - prompted if DTRK is YES. D-Channel signalling for B-channels.
CTYP	<CR>	Call Type. Enter the call type to be associated with the outgoing route for direct dialing using the trunk access code (instead of NARS access code). See the "Option 11 software guide" for a listing of possible responses.

Prompt	Response	Description
INAC	YES	Insert ESN Access Code based on NARS/BARS call type, for incoming calls on TIE routes only. If NARS is equipped, this feature inserts AC1 or AC2, depending on the responses to AC2 in LD 15 Customer Data Block. For NARS/BARS call types, INAC bypasses incoming digit insertion specified by INST in LD 16 Route Data Block. Unknown call types, including CDP steering codes, are not affected by INAC, and do not bypass digit insertion specified by INST. INAC must be set to YES to support features such as Network ACD and Network Message Services, which depend on non-call associated TCAP facility messages.

Step 6:

Configure the ISDN trunks. Use Overlay 14. For more detailed information, refer to book 1 of the Option 11 Software Guide.

Prompt	Response	Description
REQ	NEW,CHG NEW XX	Note: when assigning several members at once (i.e. a full T-1) use the multiple create command NEW XX
TYPE	TIE	only TIE trunk allowed between Meridian 1/SL-1s
TN	C ch	enter the DTI/PRI trunk card (C) and channel number (ch). C = 1-9, ch = 1-24
RTMB	RRR MMM	route (created in step 5) (RRR) and member number (MMM).
INC	(YES), NO	For MULTIPLE NEW command: If yes, channel numbers will be associated with members starting at the TN, both channel and member numbers increasing. If no, member numbers decrease as channel numbers increase.

Step 7:

Assign clock's reference source. Use Overlay 73. For more detailed information, refer to book 2 of the Option 11 Software Guide.

Prompt	Response	Description
REQ	CHG	
TYPE	DDB	Digital Data Block
CLKN	1-9	Card slot number of the NTAK09 circuit card which supports the NTAK20 Clock Controller.
PREF	1-9	This is the PRI T1 which the clock controller will use as it's primary source to synchronize (track) the system network clock. This response must be the same as the response to the CLKN prompt above, otherwise an SCH will be printed. A carriage return <CR> here signifies the system will operate in free-run (non-tracking). Note that free-run is used when this Meridian PBX serves as the clock source master for the private network. See chapter 3 for more details on clocking.
SREF	1-9	Secondary reference source for clock controller -- prompted only if primary source is not free-run. Enter the PRI card number of the DTI/PRI card which is to be used as the secondary clock reference. This is the PRI T1 which the clock controller will use as its secondary source to synchronize (track) the system network clock. Only used when unable to track on the primary source (i.e. too many slips). Note: Prompted only when more than 1 DLOP exists.

Programming Meridian 1 to DMS-100 PRI

Configurations allowed

Connection to the DMS 100 Central Office from the Meridian 1 is allowed in three configurations. See also the ISA feature description in Chapter 1 for ISA release 16 considerations.

Basic PRI

- 1 Dedicated channels similar to Digital Trunk Interface (DTI) but with CLID, speed-of-call-answer and out-of-band signaling. When following the PRI software programming procedure for Meridian 1 to Meridian 1, keep in mind that the connection is now to a Central Office and that other trunk types besides TIE are supported (COT, DID, WATS, and so on).

PRI ISA — No Min/Max

- 2 Dynamically allocating trunk types on a call-by-call basis without reserving a minimum number of channels for any one service. (Network Service Facility — NSF=NO and no MIN and MAX settings).

PRI ISA — Min/Max

- 3 Dynamically allocating trunk types on a call-by-call basis but managed with a minimum and maximum number of channels for every service (i.e. COT, DID, and so on). This is the preferred method and is accomplished with the Network Service Facility (NSF) prompt set to YES and MIN and MAX settings.

Configurations 2 and 3 (ISA) above are explained in detail in this section.

Note: It is important to point out that it is possible for a customer to have a combination of the above configurations. For instance, some channels are dedicated while others are shared and dynamically allocated on a call-by-call basis.

Accessing an ISA Route member

The Integrated Service Access Route simply provides a path for the various service routes using it. (Service routes are COT, WATS, FX, DID, and TIE routes). The ISA route member is never accessed directly. Instead, Service Routes are defined and are accessed through the normal methods (ACOD, ESN).

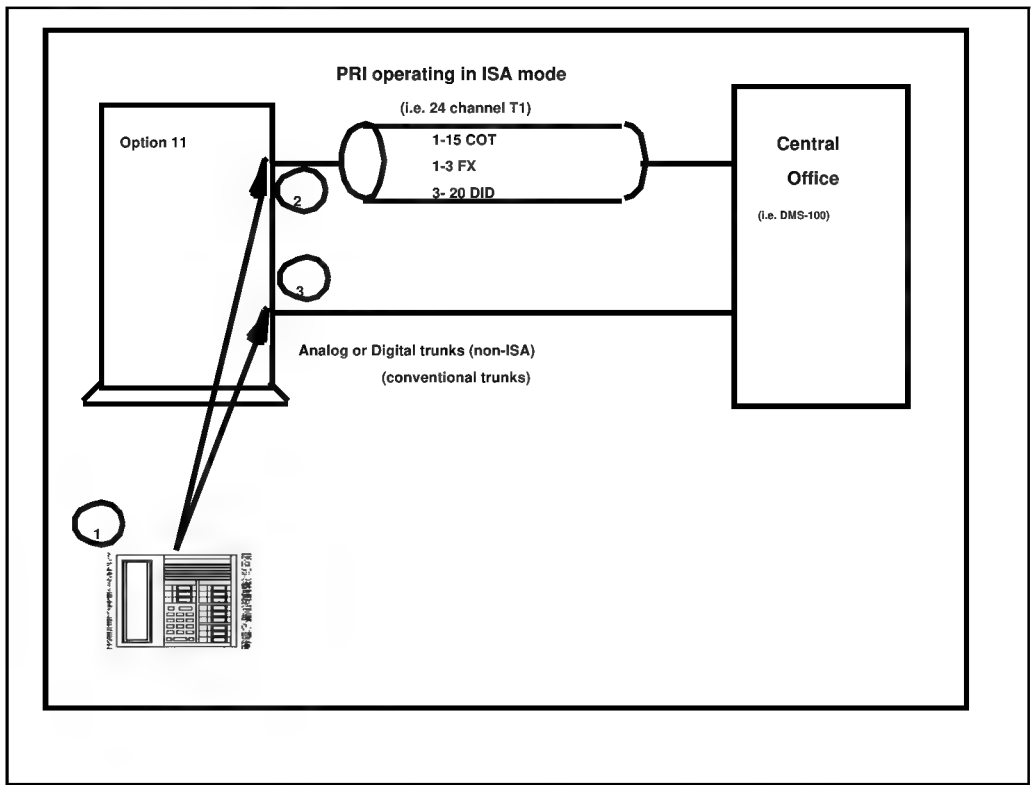
Outgoing Calls

The practical application of ISDN requires some form of ESN (CDP or NARS). The Route List Tables found in LD 86 will include the Service routes. Meridian 1 software automatically performs the digit translation and sends the call out on an ISA route associated with the Service route selected. IAS operation is transparent to end-users. The ESN Route List Block can contain both ISDN and non-ISDN entries.

Incoming Calls

For calls coming into the Option 11, similar translation is performed by the Central Office and an ISA channel is selected based on the Service required. Again, this is transparent to the end-user.

Figure 63
Example of ISA Call Routing



- 1 Callers usually access the PRI Service Route by dialing the usual ESN number (NARS or CDP).
- 2 The Service Route does not have any trunk members of its own and therefore selects an ISA "B" channel.
- 3 In the event that all ISA "B" channels are busy or the Service Route MAX setting has been reached (i.e. 15 outgoing COT calls), stepping to a non-ISA entry in the Route Block List, if so equipped, is possible.

ISA Programming

Basic PRI configuration must be performed before Integrated Services Access (ISA) is defined. An ISA route and associated ISA trunks, followed by service routes, are then defined (Service routes are COT, DID, FEX, WATS, and TIE). Service routes do not have trunk members but use the ISA trunk members. Therefore, the ISA trunks are shared by the various service routes associated with it on a call-by-call basis.

The following few pages identify and provide a short description of some of the most important prompts which are used to control the Dynamic Channel Assignment mechanism. These prompts are:

- a NSF
- b MIN and MAX
- c SID

MIN and MAX

You can control the number of simultaneous calls of a certain type from a certain service route through an ISA route by defining the Maximum and Minimum settings. You can define a maximum number of calls allowed per service route and a minimum number of "B" channels that are ready for use. The MIN and MAX prompts appear when the NSF prompt is set to YES in the ISA route.

The MIN and MAX prompts in LD 16 limit the minimum and maximum simultaneous calls associated with each service route. The rule-of-thumb for setting these two thresholds is as follows:

MIN - The sum of all MIN values of the service routes associated with an ISA route must never exceed the number of "B" channels (ISA trunks) defined for the ISA route.

The sum of all the MIN values are less than or equal to total "B" channels.

MAX - The MAX settings for any service route:

MAX for service route "X" < or = Total "B" channels - (sum of all the MINs except this service route).

If the service route exceeds its maximum number of simultaneous calls allowed, or all the ISA "B" channels are busy, then you can specify an overflow route in LD 16 STEP prompt) for direct access or LD 86 Route List Table Entry for ESN access. The route number for the step prompt is not permitted to be an ISA route number or a service route number.

Service Identifier (SID)

In addition to the call type, each call is identified by a service identifier (SID) which is used by the Meridian 1 and the DMS 100 for routing. The SID prompt is available when the NSF prompt is set to YES. The service identifier must be set up in coordination with the CO on a per route basis. The function of the SID is simply to identify the Service Route being used, since the Service Route number as we know it (programmed in LD 16) does not mean anything to the CO.

Note: what we call SID on the Meridian 1 is referred to as "FACNUM" in the DMS table editor.

Network Service Facility (NSF)

NSF=NO

Having the Network Service Facility disabled provides the Call-by-Call Pool of trunks as explained earlier without the MIN and MAX settings. No control is provided, therefore, as to the number of "B" channels used for any one service.

Additionally, when you assign NSF to NO in LD 16, a route number for COTR and TIER should also be assigned. The COTR can be a route number for an incoming CO or incoming DID route and is used for public calls. For incoming public calls, if COTR is a CO route, it is routed to the attendant. If it is a DID route, it translates the 3 or 4 digits. For private calls (TIER), the called number is translated based on the programming for the Tie service route in overlay 16 and ESN digit manipulation table if appropriate.

NSF=YES

This is the preferred method of controlling the allocation of ISA "B" channels for the various Service Routes. When the NSF prompt is YES, then a route for COTR and WATR should be assigned. The COTR can be a route number for an incoming CO or incoming DID route, as above. The WATR is the route used for WATS service. The TIER prompt does not appear and TIE calls are handled based on their SID.

Additionally, when NSF is set to YES, the MIN and MAX prompts have to be programmed as explained earlier. When the MAX value is reached in a service route, the All Trunks Busy counter is incremented. (The ATB count is not incremented when NSF is NO). The ATB value is provided during the printing of traffic reports. The ATB counter of an ISA route is also incremented when the last "B" channel of the ISA is busied. This occurs regardless of whether the NSF prompt is YES or NO.

Programming procedure

Use this procedure to configure the Meridian 1 to a DMS 100 PRI or Integrated Service Access (ISA) interface.

Note: NTP 553-2901-300 contains a PRI database correlation for SL-1 to DMS software programming.

Programming a Meridian 1 to DMS 100 interface involves eight major steps:

- 1 Define error detection thresholds—LD73
- 2 Add a PRI loop—LD17.
- 3 Add a DCHI card—LD17
- 4 Define a PRI customer—LD15.
- 5 Define the ISA route—LD16.
- 6 Define the ISA channels (B-channels) or trunks—LD14.
- 7 Define all service routes—LD16.
- 8 Define clock synchronization—LD73.

Step 1:

Define the threshold parameters and Clock synchronization. Use Overlay 73.

Prompt	Response	Description
REQ	NEW	
TYPE	DDB	Digital Data Block
TRSH	0-15	assign a threshold set or table, enter this number in overlay 17 when defining a DTI/PRI digital card
RALM	1-(3)-128	yellow alarm 24-hour threshold
BIPC	1-(2)-128	24-hour bit rate violation threshold
LFAC	1-(3)-128	24-hour loss of frame alignment threshold
BIPV	1-(2 or 3)-4	bit rate (bipolar violation and CRC) monitoring limits. Maintenance and out-of-service threshold.
SRTK	1-(5)-24	frame slip-tracking-monitoring limits in hours
	1-(30)-3600	frame slip-tracking-monitoring limits in seconds
SRNT	1-(15)-1024	non-tracking slip rate monitoring maintenance and out-of-service
	1-(3)-1024	
LFAL	1-(17)-10240	loss of frame alignment monitoring maintenance and out-of-service
	1-(511)-10240	
SRIM	(1)-127	slip rate improvement timer
SRMM	1-(2)-127	maximum number of times the slip rate exceeds the maintenance limit

Step 2:

Add a PRI loop. Use Overlay 17.

Prompt	Response	Description
REQ	CHG	
TYPE	CEQU	configuration data block
DLOP	C dd ff	where: • C is the DTI/PRI digital card number (1-9) • dd is the number of data calls allowed (0-24) on this PRI (default 24) • ff is the frame format used (D2,D3,D4,ESF) where default is ESF
MODE	PRI	select Primary Rate Interface mode
LCMT	(B8S) AMI	code substitution method - must match the far-end. B8S.— B8ZS code substitution and AMI — B7 code substitution rule. The preferred method is B8ZS to get 64 K clear channel as long as the T1 carrier equipment supports it.
YALM	DG2 (FDL)	yellow alarm method — prompted only if the frame format is ESF. Must match the far end. Use FDL with ESF and use DG2 with non-ESF. If not prompted then DG2 is set automatically.
TRSH	0-15	the maintenance and out of service threshold set to be used for this PRI card, as configured in overlay 73.

Step 3:

Add a D-Channel Interface. Use Overlay 17. For more detailed information, refer to book 1 of the Option 11 Software Guide.

Prompt	Response	Description
REQ	CHG	
TYPE	CFN	configuration data block
ADAN	NEW DCH 1-15 CHG DCH 1-15 OUT DCH 1-15	Add a primary D-Channel port number. Any unused SDI port number Change a primary D-Channel Out the primary D-Channel
CTYP	DCHI MSDL	DCHI for D-Channel configuration for the NTAK09 card. Enter DCHI for the NTAK93 DCH card. Enter MSDL for the NTBK51 Downloadable D-channel daughterboard
CDNO	1-9	Card slot number to be used as the primary DDCH/DCHI
PORT	1	PORT must be set to "1"
DES	<CR>	Back-up DCHI port number, if required
USR	PRI	D-channel is for ISDN PRI only.
IFC	(D100) ESS4 ESS5 S100 D250	Meridian 1 to DMS-100 Meridian 1 to AT&T ESS4 Meridian 1 to AT&T ESS5 Meridian 1 to SL-100 Meridian 1 to DMS 250
DCHL	(1-9)	PRI card number which will be carrying the D-channel. Must match entry made for the "CDNO" associated with the "DCHI" prompt above
OTBF	1-(16)-127	number of output request buffers. Note: for a single PRI link, leave this prompt at default (16). Add 5 output request buffers per additional link.

Prompt	Response	Description
RLS	XX	X11 software release of far-end. This is the current software release of the far end. If the far end has an incompatible release of software, it prevents the sending of application messages, i.e. for Network Ring Again.
OVL R	<CR>	Allow or disallow overlap receiving on a D-channel. Default is NO.
LAPD	YES,(NO)	change LAPD parameters. Enter carriage return if timers are to be left at default. The following timers are prompted only if LAPD is set to YES. (They can all be left at default during initial set-up.)
T23	1-(20)-31	interface guard timer checks how long the interface takes to respond. In units of 0.5 seconds (default 20 = 10 seconds).
T200	2-(3)-40	retransmission timer in units of 0.5 seconds (default 3 = 1.5 seconds).
N200	1-(3)-8	maximum number of retransmissions
N201	4(260)	maximum number of octets in information field
K	1-(7)-32	maximum number of outstanding unacknowledged frames (NAKS)

Step 4:

Define a PRI customer. Use Overlay 15.

Prompt	Response	Description
REQ	NEW,CHG	New or change data
TYPE	CDB NET_DATA	customer data block Networking data (Release 21 gate opener)
CUST	0-31	customer number
LDN X	xxxx(xxx)	enter the customer's Listed Directory Number (if DN is EXP equipped then up to 7 digits may be entered). The length of LDN0 determines the number of digits translated on PRI DID routes.

Prompt	Response	Description
AC2	aaa	ESN Access Code 2. Enter call types (type of number) that use access code 2. Multiple responses allowed. Only appears on NARS equipped systems. If a call type is not entered here, it is automatically defaulted to Access Code 1.
	NPA	E.164 National
	NXX	E.164 Subscriber
	INTL	International
	SPN	Special Number
	LOC	Location Code
ISDN	YES	customer is equipped with ISDN
PNI	1-32700	customer private network identifier. This number MUST be unique to this customer in the private network. e.g. it is used as part of the setup message for feature operation such as Network Ring Again, Network ACD. Note that if set to zero (0), NRAG and NACD will not work.
HNPA	NPA	telephone area code for this Meridian 1. Sent as part of setup message as calling line identification.
HNXX	NXX	telephone local exchange code for this Meridian 1. Sent as part of setup message as calling line identification.
HLOC	XXX	home location code (NARS)
LSC	1-9999	one to four digit Local Steering Code established in the Coordinated Dialing Plan (CDP). Required for Calling Line I.D. and Network ACD, only if CDP DNs are longer than the local DNs

Step 5:

Configure the ISA route. Use Overlay 16.

Prompt	Response	Description
REQ	NEW,CHG	
TYPE	RDB	route data block
CUST	0-31	customer number
TKTP	ISA	create an ISA trunk route
DTRK	YES	digital trunk route
DGPT	PRI	
ISDN	YES	ISDN option
MODE	PRA	route used for PRI only
PNI	1-32700	customer private network identifier. This number must be unique to this customer in the private network. e.g. it is used as part of the setup message for feature operation such as Network Ring Again, Network ACD. Note that if set to zero (0), NRAG and NACD will not work.
IFC	(D100)	interface type—Meridian 1 to DMS-100
	ESS4	Meridian 1 to AT&T ESS4
	ESS5	Meridian 1 to AT&T ESS5
	S100	Meridian 1 to SL-100
	D250	Meridian 1 to DMS-250
	D70	Meridian 1 to Japan CO
NSF	YES,(NO)	Network Service facility. See ISA programming
COTR	0-127	incoming or combination DID/CO route number--prompted if NSF is set to YES or NO.
TIER	0-127	incoming or combination TIE route number — prompted if NSF is NO
WATR	0-127	incoming or combination WATS route number — prompted if NSF is YES
CHTY	BCH	signalling type- prompted if DTRK is YES. D-Channel signalling for B-channels

Step 6:

Configure the ISA trunks. Use Overlay 14.

Prompt	Response	Description
REQ	NEW,CHG	
TYPE	ISA	ISA trunk type
TN	C ch	enter the DTI/PRI trunk card (C) and channel number (ch). C = 1-9, ch = 1-24
RTMB	RRR MMM	ISA route (created in step 5) (RRR) and member number (MMM)

Step 7:

Configure the service route. Use Overlay 16.

Prompt	Response	Description
REQ	NEW,CHG	
TYPE	RDB	route data block
TKTP	XXX	types of service routes allowed with ISDN: COT, FEX, WAT, DID and TIE.
DGTP	PRI	
DTRK	YES	digital trunk route
ISDN	YES	ISDN option
MODE	PRA	route used for PRI only
PNI	1-32700	customer private network identifier-must be the same as the PNI at the far end.
IFC	XXX	interface type: must match interface specified in the ISA route data block.
SRVC		Service type for an AT&T connection only
	(ACC)	Accunet Data Service
	SDN	Software Defined Network
	M800	Megacom 800 service
	MEG	Megacom Service
	IWAT	In-Wats Service (AT&T ESS5)

Prompt	Response	Description
	WATM	Maximum Subscribed (AT&T ESS5)
CHTY	BCH	signalling type- prompted if DTRK is YES. D-Channel signalling for B-channels
INAC	YES	Insert Access Code. Permits the NARS AC1 or AC2 access code to be re-inserted automatically on an incoming ESN call. This prompts only appears on a TIE route and must be set to "YES" in order for features such as Network ACD to function. Note : On an existing ESN network, setting this prompt to "YES" may also require modifying the Digit Manipulation Index (DMI) associated with this route at the far end (so that the Access Code doesn't get inserted twice). The INSERT prompt (INST) is bypassed if INAC is set to YES.
ISAR	YES	stepping to ISA allowed, in other words this is a service route which will be using ISA channels on a call by call basis. Setting this prompt to NO allows this service route to be used with standard dedicated "B" channels. If ISAR is set to YES the following prompts will appear.
RTN	0-127	specify the ISA route to be used by this service route
SID	0-127	service ID for this route. The service route ID must match the far end
MIN	0-191	minimum number of channels reserved on the ISA route (service dependent). See text preceding the programming for details. Coordinate with the far end.
MAX	1-191	maximum number of channels on the ISA route to be used by this service route (service dependent). See text preceding the programming for details. Coordinate with the far end.
CLS	(UNR), SRE	class of service restrictions for TIE routes
IEC	1-999	Inter-exchange Carrier—prompted if TKTP is COT, FEX or WAT. This prompt is only applicable in markets with multiple carriers.

Step 8:

Assign clock's reference source. Use Overlay 73.

Prompt	Response	Description
REQ	CHG	
TYPE	DDB	Digital Data Block
CLKN	1-9	Clock number. This is the DTI/PRI T1 which the clock controller will track as it's primary reference clock to synchronize the system network clock. A carriage return <CR> here signifies the system will operate in free-run (non-tracking). Note that free-run is used when this Meridian PBX serves as the master clock for the private network. See Chapter 3 for more details on clocking.
PREF	1-9	Primary reference source for clock controller. Enter the PRI card number of the PRI card which will have an active clock controller. This is the PRI which the clock controller will use as it's primary source to synchronize (to track) the system network clock. A carriage return <CR> here signifies the system will operate in free-run (non-tracking).
SREF	1-9	Secondary reference clock for clock controller — prompted only if primary source is not free-run. Enter the PRI Card number of the DTI/PRI card which is to provide the secondary reference. This is the PRI T1 which the clock controller will use as it's secondary reference clock to synchronize (to track) the system network clock. The CC switches automatically to SREF when unable to track on the primary source (i.e. too many slips). Reference clock tracking may also be set by maintenance commands. Note: Prompted only when more than 1 DLOP exists.